Government of Nepal
Ministry of Agriculture and Livestock Development
Department of Livestock Services
Veterinary Standards and Drug Regulatory Laboratory (VSDRL)
Budhanilkantha, Kathmandu

VSDRL Technical Bulletin | Issue No.: Special Edition | June 2020

Status of Antimicrobial Use in Livestock Sector in Nepal

Nabin Upadhyaya[1], Surendra Karki[2], Manoj Oli[1], and Ram Nandan Tiwari[3]

Summary

Antimicrobial resistance (AMR) is considered one of the greatest public health threats of modern times projected to kill 10 million people annually across the world by 2050. This is a multisectoral problem across the spectrum of human, animal, and environmental health and is caused by multifactorial reasons. One of the reasons for increasing AMR is the irrational use of antimicrobials in humans and animals. Therefore, it is necessary to promote prudent use of antimicrobials for which maintaining a database, and understanding the use pattern of antimicrobials is fundamental. The Veterinary Standards and Drug Regulatory Laboratory (VSDRL) of the Department of the Livestock Services (DLS) is the focal point of veterinary drugs for the World Organization for Animal Health (OIE) for Nepal and is responsible for reporting antimicrobial use (AMU) in animals data to OIE. The VSDRL collected AMU in animals data from various sources such as the Department of Custom, Department of Drug Administration, veterinary drug manufacturers in Nepal, and veterinary drug importers for the year 2018 and 2019. The total quantity of drug from import and manufactured in-country were converted into active pharmaceutical ingredients (API) and classified by classes of antimicrobials. The result showed that during 2018 and 2019, at least nine different classes of antimicrobials were consumed in Nepal. The classes of antimicrobials used in Nepal include 3-4 Generations Cephalosporins, Aminoglycosides, Amphenicols, Fluoroquinolones, Macrolides, Penicillins, Sulfonamides and Trimethoprim, Tetracycline, Nitrofurans and others (for example Tiamulin) are consumed in the livestock sector in Nepal. The total quantities of API consumed in animals in Nepal were 91088 kg and 47694 kg in 2018 and 2019 respectively. These data may not be complete and still need further validation and improvement in the future. The total AMU data also need to be disaggregated by animal species and route of administration. These details would guide where to target to reduce the overall use of antimicrobials in Nepal.

1 *Veterinary Officer, Veterinary Standards and Drug Regulatory Laboratory, Department of Livestock Services, Budhanilkantha, Kathmandu*
2 *National Technical Coordinator, Food and Agricultural Organization of the United Nations, Emergency Center for Transboundary Animal Diseases, Hariharbhawan, Lalitpur*
3 *Chief Veterinary Officer, Veterinary Standards and Drug Regulatory Laboratory, Department of Livestock Services, Budhanilkantha, Kathmandu*

Introduction

Antimicrobial resistance (AMR) is a global public health concern affecting human, animal, and environmental health. The World Health Organization (WHO) has estimated that currently 0.7 million people are dying from AMR annually. This mortality is projected to increase to 10 million people annually by 2050 with a loss of USD 100 trillion. Besides, the World Bank has projected that global livestock productivity will reduce by 2.5- 7.5% by 2050 which is estimated to push additional 28 million people into poverty. Several factors are contributing to the rise of AMR that include irrational use of antimicrobials in humans and livestock, over the counter availability of prescription drugs, poor infection controls in hospitals, poor biosecurity measures in farms leading to more use of antimicrobials, high prevalence of infectious diseases, lack of awareness among consumers and the slow discovery of new antimicrobials.

Antimicrobial agents are a global public good and are necessary to save the lives of both humans and animals. Given the higher global livestock population compared to human population, antimicrobial use (AMU) in livestock outweighs human consumption worldwide (FDA, 2020). With a growing demand for animal protein, antimicrobials are used not only for therapeutic purposes but also for preventive purposes and as growth promoters (Aarestrup, 2015). However, in most developing countries including Nepal, the data are not adequately maintained to track different types of antimicrobials and their quantities being used. Sustained monitoring of AMU is a critical component to fight against AMR and has been included under the fourth strategic priorities of the AMR Global Action Plan (GAP) (WHO 2020). Many high-income countries, such as those within the European Union (EU), regularly publish their data on AMU in humans and animals and relate these values to denominator populations in terms of biomass. Conversely, the majority of low-and-middle-income countries (LMICs) do not regularly collect and report equivalent AMU statistics. The situation is even poor in animal health. To fulfill this gap, the World Organization for Animal Health (OIE) has been collecting AMU data in animals from across the countries annually since 2015. The OIE estimated that worldwide, on average 168.7 mg of antimicrobial active ingredients (AAIs) were used to raise 1 kg of animal biomass (OIE, 2018). The OIE collects data under three different reporting options in addition to the baseline information. The baseline includes basic country information which is mandatory for all member countries. For countries which have quantified AMU data, the three reporting options are (1) AMU data by their intended use (growth promoter and therapeutic); (2) Data in reporting option 1 further classified by species and (3) Data in reporting option 2 further classified by their route of administration.

In Nepal, there is no systematic surveillance system in place to monitor the AMU in animals. However, as Nepal is a member of OIE, Nepal has the international obligation to send an annual AMU in animals report to OIE. Nepal reported only baseline information for the first two reporting cycles while started to report under reporting option 1 for the past two years. The objective of this technical bulletin is to review the situation of AMU in animals in Nepal based on the report sent to OIE.

Materials and Methods

The information of AMU in animals in Nepal were collected from various sources.

Sources of Data

Department of Drug Administration

The information on the registered antimicrobials was obtained from the Department of Drug Administration (DDA), Government of Nepal, which is the national competent authority for registering of all antimicrobials, both humans and animals, under the Dug Act (1978).

Veterinary Drug manufacturers in Nepal

Information on the volumes of antimicrobials manufactured and supplied for animals by the veterinary pharmaceutical industries in Nepal was obtained from all eight veterinary pharmaceutical companies registered in DDA.

Veterinary drug importers

Information on the volumes of antimicrobials imported for animal use by the veterinary importers in Nepal was collected from the DDA.

Department of Customs

Information on the volumes of antimicrobials imported for animals in Nepal was obtained from the Department of Customs, Government of Nepal.

Data analysis

All the data collected from various sources were entered into Microsoft Excel. Quantities (number of vials or packs) including the amount of active ingredients in each product were recorded for each antimicrobial class and combination products. As Nepal imposed a ban on the use of antimicrobials as growth promoters, all antimicrobials considered to be used for therapeutic purposes. Antimicrobials were then classified as Aminoglycosides Amphenicols, Cephalosporins (all generations), Fluoroquinolones, Macrolides, Nitrofurans, Penicillins, Sulfonamides (including trimethoprim), Tetracyclines, Others (e.g. Tylosin, Tiamulin, Bacitracin, Tilmicocin) as per the OIE reporting requirements. The quantities of all antimicrobial ingredients in the drug preparations were then calculated and entries prepared into the datasheet.

Amounts of antimicrobial agents were calculated in kilogram active ingredient for each particular antimicrobial class collected. Only data from the Department of Customs was used to estimate imported volume to avoid duplication of data. The total volume of antimicrobials obtained from import and in-country manufactured was converted into active ingredients in kilograms. The information provided in the manufacturer's package was used to calculate the quantities of active ingredients.

Results

Classes of antimicrobials for animal use in Nepal

A total of 96 trade name registered antimicrobials were available for animals in Nepal, which comprised of 35 different genera of antimicrobials that belonged to 9 different antimicrobial class and additional antibiotics grouped as "others" that included Tylosin, Tiamulin, Bacitracin, Tilmicosin. It is believed that all of the antimicrobials are used for therapeutic purposes.

Quantities of antimicrobials consumed per annum from 2018 to 2019

The total active pharmaceutical ingredients (API) of antimicrobial used in Nepal was 91088 kg in 2018 while only 47694 kg of antimicrobial API was recorded in the year 2019. It was observed that there was substantially less volume of antibiotics being imported in 2019 as there was not much difference in the volume of in-country production. It might due to the leftover stock from 2018 or may be a reflection of tighter regulation for veterinary antibiotics import from the DDA. It was found that antimicrobials from Sulphonamides and "others" categories including Tylosin, Tiamulin, Bacitracin, and Tilmicocin were most consumed in the year 2018. Similarly, Tetracycline, 3rd, and 4th generation Cephalosporin and Fluoroquinolones were also consumed more than 10,000 kg API (Table 1 and Figure 1). In 2019, major antibiotics consumed include Sulfonamides, Tetracycline, Fluoroquinolones and, the 3rd and 4th generation of Cephalosporin however, the volume reported seems comparatively lower (Table 1 and Figure 4).

Table 1. Antimicrobial classes used in livestock in Nepal

Antibiotic class	2018 active ingredients (kg)	2019 active ingredients (kg)
3-4 Generations Cephalosporins	11355	9061
Aminoglycosides	4056	2820
Amphenicols	648	141
Fluoroquinolones	10162	6535
Macrolides	9329	1575
Others	16927	2184
Penicillin	8051	1296
Sulfonamides (including trimethoprim)	15916	12512
Tetracycline	12769	9696
Nitrofurans	1875	1875
Total	91088	47694

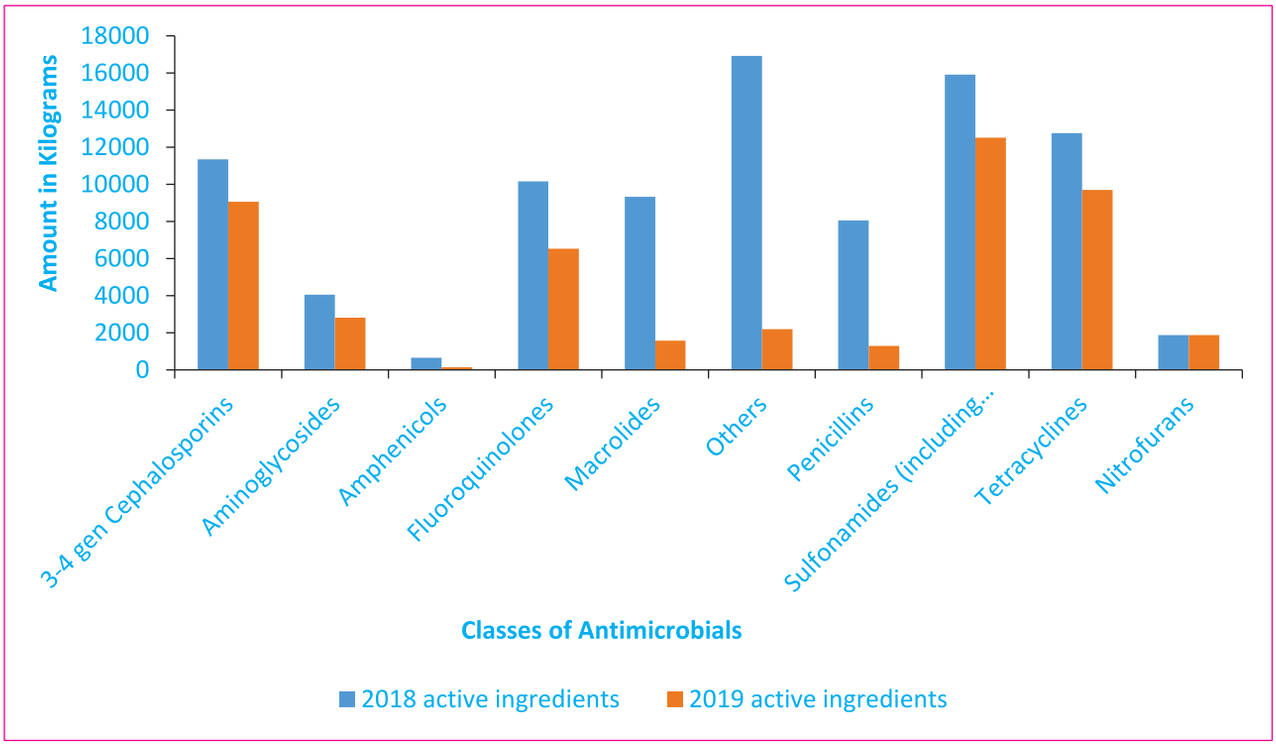

Figure 1. Antimicrobial classes used in livestock in Nepal

Table 2. Quantity of active ingredients of antibiotics consumed in Nepal in 2018 and 2019

Genera wise Antibiotics	2018 active ingredients (kg)	2019 active ingredients (kg)
Amikacin	75.2	225.97
Amoxycillin	2005.71	296.58
Ampicillin	5657.5	780.4
Azithromycin	249.1	118.8
Bacitracin	1750	-
Benzathine Penicillin	128.50	14.27
Ceftiofur	-	24
Ceftizoxime	8725	260
Ceftriaxone	2179.54	8326.93
Chlortetracycline	2272	-

Ciprofloxacin	433.65	3000
Cloxacillin	101.75	171.25
Colistin sulphate	8452.54	956.49
Doxycycline	1723.232	205
Enrofloxacin	1003.54	227.90
Erythromycin	29.27	-
Florfenicol	648	140.79
Flumequine	43.2	-
Gentamycin	526.1	249.73
Levofloxacin	2661.9	-
Lincomycin	10	-
Neomycin	1071.24	-
Oxytetracycline	2996.01	990.96
Penicillin	28.93	19.02
Procaine Penicillin	128.50	14.27
Streptomycin	58.47	19.2
Sulfadimidine	63.80	111.42
Sulfamethoxazole	400.8	384
Sulphadiazine	2702.4	480
Tiamulin	846.3	620
Tilmicocin	229.39	17.5
Trimethoprim	2249.28	1036.8
Tylosin	13488.66	846

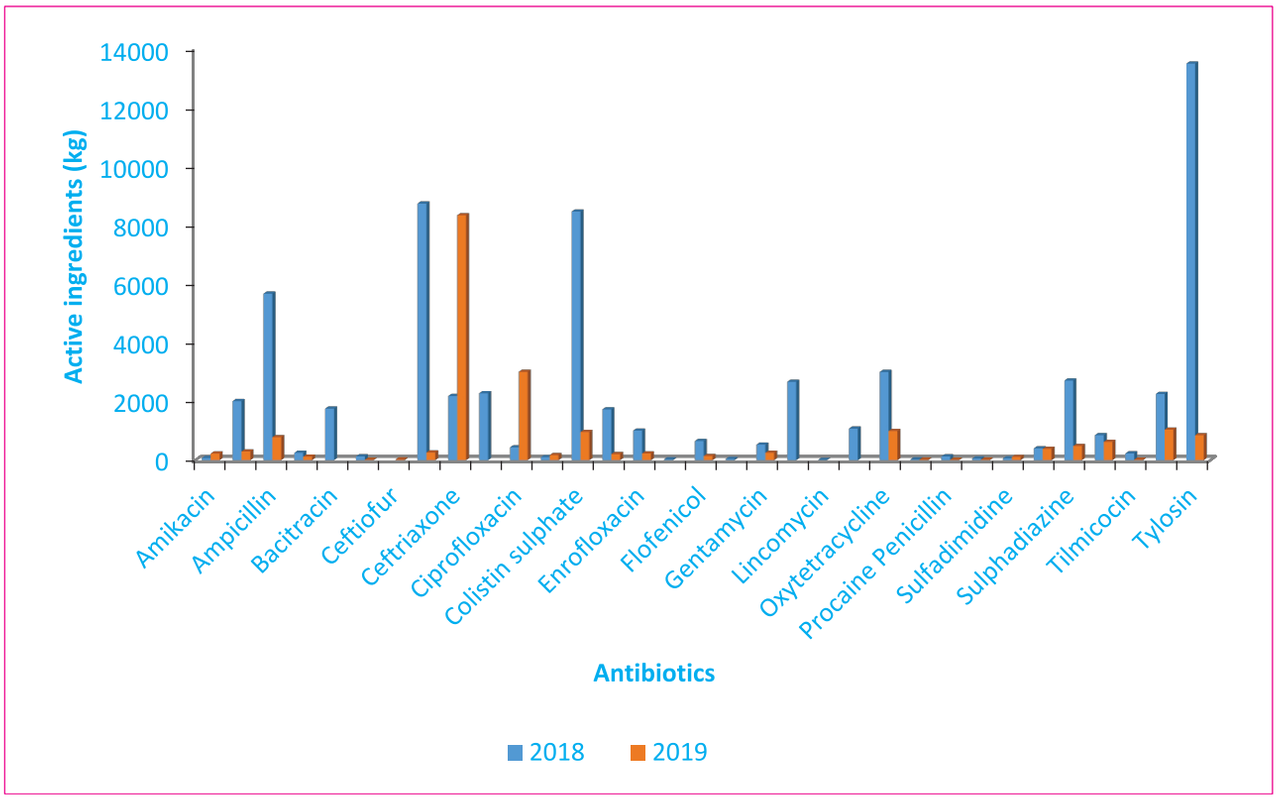

Figure 2. Quantity of active ingredients of antibiotics consumed in Nepal in 2018 and 2019

Limitations

Despite our effort to collect the information as far as possible, it might still be incomplete. Besides, the data could not be disaggregated based on which species the antimicrobials were intended to be used for and the route of administration. Though the term antimicrobial is used, mostly antibiotics are included in this report.

Conclusion

Antimicrobial use in animals is considered one of the several reasons for the development of AMR in both animals and humans. Therefore, tracking AMU data in animals and maintaining its database is important to tackle the problem of AMR in both animals and humans. OIE has been maintaining the global database on AMU in animals collecting country-level annual data from each member state. Nepal also has been reporting to the OIE as a member state. The Veterinary Standards and Drug Regulatory Laboratory (VSDRL) is the focal point of the DLS to report AMU in animals to OIE and has been collecting data from various sources including the Department of Custom, Department of Drug Administration, veterinary drug manufacturers and importers. The data from 2018 and 2019 showed that more than nine classes of antimicrobials including 3-4 Generations Cephalosporins, Aminoglycosides, Amphenicols, Fluoroquinolones, Macrolides, Penicillins, Sulfonamides (including trimethoprim), Tetracycline, Nitrofurans, and others are consumed in the livestock

sector in Nepal. The quantities of API was 91088 kg in 2018 while it was 47694 kg in 2019. Since VSDRL is in the initial phases of AMU data collection, these data still need further validation and improvement. Also, the total AMU data need to be classified by species and route of administration to be able to report in the reporting option 2 and 3.

Acknowledgments

We would like to acknowledge Department of Custom and Department of Drug Administration for sharing their information. We are also thankful to veterinary drug manufacturers in Nepal and veterinary drug importers for sharing their data and cooperation. We are also indebted to OIE country focal point and Director General of the Department of Livestock Services and other DLS officials for supporting us. We thank all staff of VSDRL for their dedication and hard work. Finally, we are thankful to FHI 360 Nepal for their technical support through the Fleming Fund Country Grant Nepal.

References

Aarestrup, F.M., 2015. The livestock reservoir for antimicrobial resistance: a personal view on changing patterns of risks, effects of interventions, and the way forward. Philosophical Transactions of the Royal Society B: Biological Sciences, 370(1670), p.20140085.

FDA, 2020. Antimicrobial resistance. Available at: https://www.fda.gov/animal-veterinary/safety-health/antimicrobial-resistance (accessed July 9, 2020).

WHO, 2020. Antimicrobial resistance. Available at: https://www.who.int/health-topics/antimicrobial-resistance (accessed July 9, 2020).

OIE, 2018. OIE annual report on antimicrobial agents intended for use in animals. Available at: https://rr-africa.oie.int/wp-content/uploads/2019/09/annual_report_amr_3.pdf (accessed July 9, 2020)

Government of Nepal
Ministry of Agriculture and Livestock Development
Department of Livestock Services
Veterinary Standards and Drug Regulatory Laboratory (VSDRL)
Budhanilkantha, Kathmandu
Phone: 01-4650457, **Fax:** +977-1-4650833
Email: vsdrlktm@gmail.com, **Website:** www.vsdrl.gov.np